Roadmap to Operating SDN-based Networks:

State of the SDN Union in R&E and Universities

Bryan Learn

Pittsburgh Supercomputing Center

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DANCES - Developing Applications with Networking Capabilities via End-to-End SDN

- NSF funded CC-NIE collaborative research project
- Two year project
- Integration of SDN/OpenFlow network bandwidth control capability with resource job scheduling and distributed file systems

DANCES Participants and Partner Sites

- Pittsburgh Supercomputing Center (PSC)
- National Institute for Computational Sciences (NICS)
- Pennsylvania State University (Penn State)
- National Center for Supercomputing Applications (NCSA)
- Texas Advanced Computing Center (TACC)
- Georgia Institute of Technology (GaTech)
- eXtreme Science and Engineering Discovery Environment (XSEDE)
- Internet2

Our main goal

- Use bandwidth control and scheduling capability to mitigate congestion-induced throughput problems on end-site networks.
  - Leverage deep programmablity to schedule network resources
  - Requires OpenFlow 1.3 with metering

PSC

Environment

- Switches
  - Corsa – pure SDN
  - HP – hybrid SDN
- Controller
  - Ryu
- Application
  - In-house developed app for accepting and scheduling bandwidth requests

Environment

- Site-to-site connection over AL2S
- Last mile
  - Each site has it's own SDN switch and controller
  - One centralized controller talks to each site's switch via FSFW on AL2S

Challenges

- Viewing the network as a resource - like compute or storage resources
- Lack of common Northbound API
  - Network applications highly dependent on the controller
- Need higher-level abstraction from the application's perspective
  - Some of our NBI communication looks much like OpenFlow